

**WHAT IS CLAIMED IS:**

1. A control operation device which receives a position feed-forward signal (xff), a torque feed-forward signal (tff), and a position detection value (xfb) of a controlled object, calculates an operation amount so that the position detection value (xfb) coincides with the position feed-forward signal (xff), and outputs the operation amount, the control operation device, comprising:

an error signal calculation unit; and

an error compensation operation unit,

wherein the error signal calculation unit outputs a signal given by multiplying an error (err) given by subtracting the position detection value (xfb) from the position feed-forward signal (xff) by a gain  $\alpha$  as an error command (err\_ref), and outputs a signal given by changing a sign of the error (err) and multiplying a gain  $\beta$  as an error feedback value (err\_fb), and

wherein the error compensation operation unit controls so that the error command (err\_ref) and the error feedback value (err\_fb) coincide, and outputs an error torque command value (err\_tref), and adds the torque feed-forward signal (tff) and the error torque command value (err\_tref) to give the operation amount (tref).

2. A control operation device comprising a speed control portion which receives a position feed-forward signal (xff), a speed feed-forward signal (vff), a torque feed-forward signal (tff), a position detection value (xfb) of a controlled object, and a speed detection value (vfb) of the controlled object, calculates an operation amount so that the position detection value (xfb) of the controlled object coincides with the position feed-forward signal (xff), and outputs the operation amount,

the control operation device, comprising:

an error signal calculation unit; and

an error compensation operation unit,

wherein the error signal calculation unit outputs a signal given by multiplying an error (err) given by subtracting the position detection value (xfb) from the position feed-forward signal (xff) by a gain ( $\alpha$ ) as an error command (err\_ref), and outputs a signal given by changing a sign of the error (err) and multiplying a gain ( $\beta$ ) as an error feedback value (err\_fb), and

wherein the error compensation operation unit

controls so that the error command (err\_ref) and the error feedback value (err\_fb) coincides and outputs an error torque command value (err\_tref),

inputs a signal (verr) given by subtracting a speed detection value (vfb) from the speed feed-forward signal (vff) into the speed control portion, and

adds the torque feed-forward signal (tff), a feedback torque command value (tfb) outputted from the speed control portion, and the error torque command value (err\_tref) to give the operation amount (tref).

3. A control operation device comprising a speed control portion which receives a position feed-forward signal (xff), a speed feed-forward signal (vff), a torque feed-forward signal (tff), a position detection value (xfb) of a controlled object, and a speed detection value (vfb) of the controlled object, calculates an operation amount so that the position detection value (xfb) of the controlled object coincides with the position feed-forward signal (xff), and outputs the operation amount,

the control operation device, comprising:

an error signal calculation unit; and

an error compensation operation unit,

wherein the error signal calculation unit outputs a signal given by multiplying an error (err) given by subtracting the position detection value (xfb) from the position feed-forward signal (xff) by a gain ( $\alpha$ ) as an error command (err\_ref), and outputs a signal given by changing a sign of the error (err) and multiplying a gain ( $\beta$ ) as an error feedback value (err\_fb), and

wherein the error compensation operation unit

controls so that the error command (err\_ref) and the error feedback value (err\_fb) coincides and outputs an error speed command value (err\_vref),

inputs a signal (verr) given by adding the speed feed-forward signal (vff) and the error speed command value (err\_vref) and subtracting a speed detection value (vfb) therefrom into the speed control portion, and

adds the torque feed-forward signal (tff) and a feedback torque command value (tfb) outputted from the speed control portion to give the operation amount (tref).

4. A control operation device comprising a speed control portion which receives a position feed-forward signal (xff), a speed feed-forward signal (vff), a position detection value (xfb) of a controlled object, and a speed detection value (vfb) of the controlled object, calculates an operation amount so that the position detection value (xfb) of the controlled object coincides with the position feed-forward signal (xff), and outputs the operation amount,

the control operation device, comprising:

an error signal calculation unit; and

an error compensation operation unit,

wherein the error signal calculation unit outputs a signal given by multiplying an

error (err) given by subtracting the position detection value (xfb) from the position feed-forward signal (xff) by a gain ( $\alpha$ ) as an error command (err\_ref), and outputs a signal given by changing a sign of the error (err) and multiplying a gain ( $\beta$ ) as an error feedback value (err\_fb), and

wherein the error compensation operation unit  
controls so that the error command (err\_ref) and the error feedback value  
(err\_fb) coincides and outputs an error speed command value (err\_vref),  
inputs a signal (verr) given by adding the speed feed-forward signal (vff) and  
the error speed command value (err\_vref) and subtracting a speed detection value (vfb)  
therefrom into the speed control portion, and  
gives a signal outputted from the speed control portion as the operation amount  
(tref).

5. The control operation device as recited in any one of claims 1 to 4, wherein  
the error compensation operation unit performs feed-forward control and feedback  
control.

6. The control operation device as recited in any one of claims 1 to 4, wherein  
the error compensation operation unit performs predictive control for determining a  
control input so that an evaluation function about a predicted value of a future error  
obtained by using a model of a controlled object and a control input are minimized,  
wherein the future error is a difference between the error command (err\_ref) and the  
error feedback value (err\_fb), and wherein the control input is given as an output of an  
error compensation operation unit.

7. The control operation device as recited in any one of claims 1 to 6, wherein  
wherein a relation between the gain  $\alpha$  and the gain  $\beta$  is expressed by a predetermined  
function, whereby when one of gain values is decided, the other is determined  
automatically.